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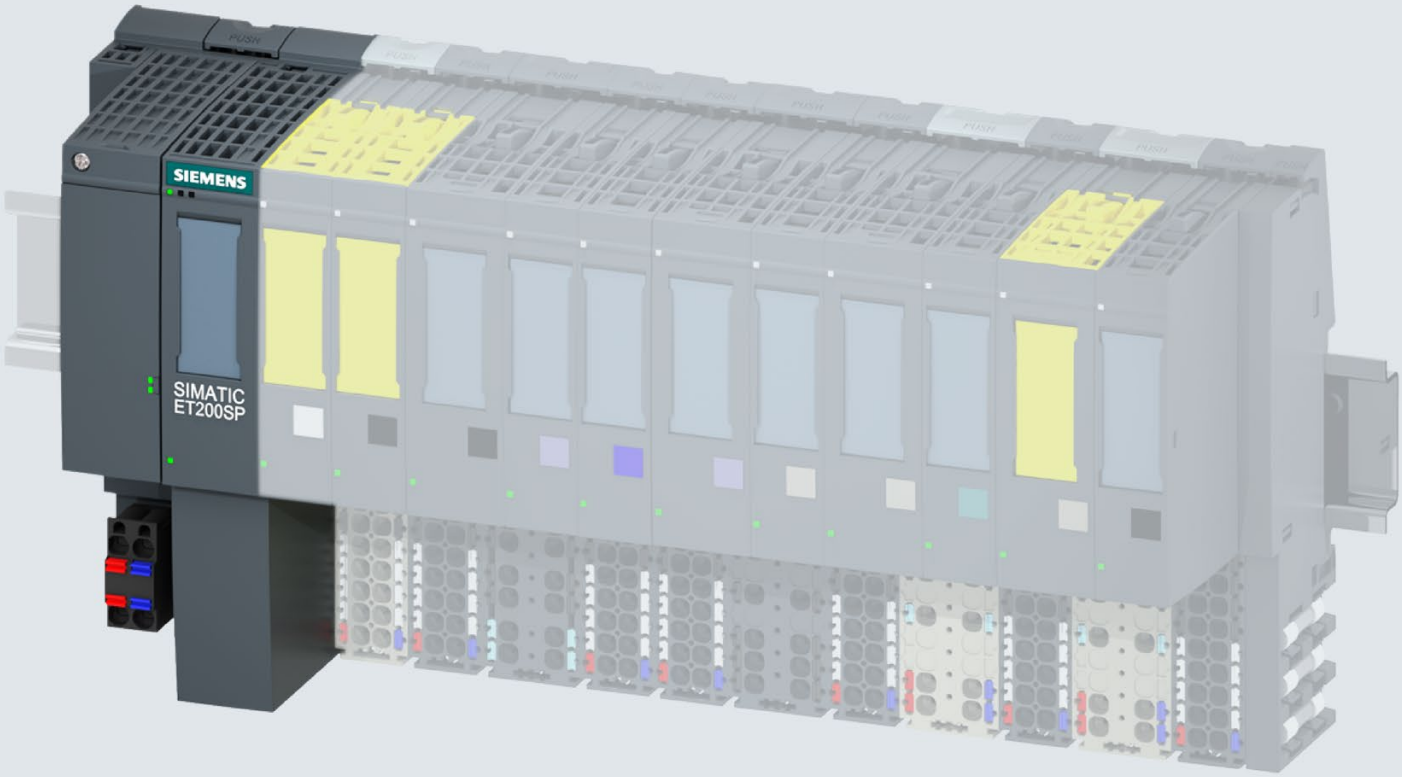

Manual

SIMATIC

ET 200SP

Interface module IM 155-6 DP HF
(6ES7155-6BA01-0CN0)

Edition 10/2018

support.industry.siemens.com

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SIMATIC

ET 200SP
Interface module IM 155-6 DP HF (6ES7155-6BA01-0CN0)

Manual

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Legal information

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This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

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⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

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Preface

Purpose of the documentation

This manual supplements the ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293) system manual.

Functions that generally relate to the system are described in this manual.

The information provided in this manual and in the system/function manuals supports you in commissioning the ET 200SP distributed I/O system.

Conventions

Please also observe notes marked as follows:

Note

A note contains important information on the product described in the documentation, on the handling of the product or on the section of the documentation to which particular attention should be paid.

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To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under (https://www.siemens.com/industrialsecurity).

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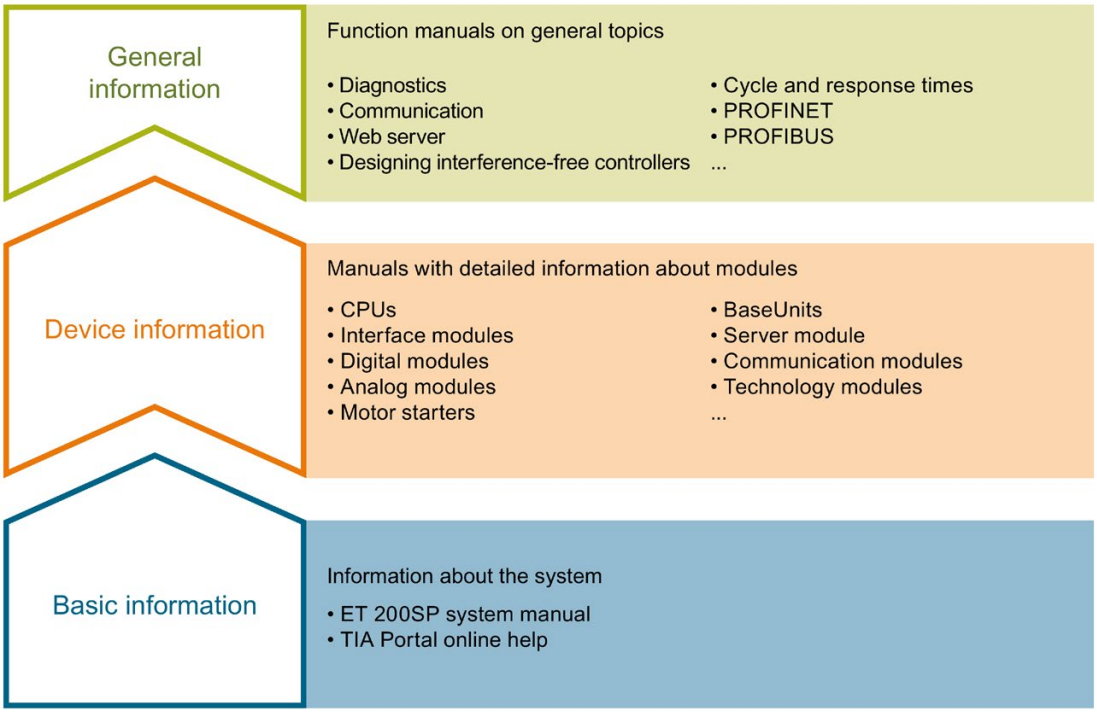
Guide to documentation

1

The documentation for the SIMATIC ET 200SP distributed I/O system is arranged into three areas.
This arrangement enables you to access the specific content you require.



Basic information

The system manual describes in detail the configuration, installation, wiring and commissioning of the SIMATIC ET 200SP. distributed I/O system. The STEP 7 online help supports you in the configuration and programming.

Device information

Product manuals contain a compact description of the module-specific information, such as properties, wiring diagrams, characteristics and technical specifications.

General information

The function manuals contain detailed descriptions on general topics regarding the SIMATIC ET 200SP distributed I/O system, e.g. diagnostics, communication, Web server, motion control and OPC UA.

You can download the documentation free of charge from the Internet (https://support.industry.siemens.com/cs/ww/en/view/109742709).

Changes and supplements to the manuals are documented in a Product Information.

You can download the product information free of charge from the Internet (https://support.industry.siemens.com/cs/us/en/view/73021864).

Manual Collection ET 200SP

The Manual Collection contains the complete documentation on the SIMATIC ET 200SP distributed I/O system gathered together in one file.

You can find the Manual Collection on the Internet (http://support.automation.siemens.com/WW/view/en/84133942).

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With "mySupport", your personal workspace, you make the most of your Industry Online Support.

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In the Documentation area of "mySupport", you have the possibility to combine complete manuals or parts of them to make your own manual.
You can export the manual in PDF format or in an editable format.

You can find "mySupport" - Documentation in the Internet (http://support.industry.siemens.com/My/ww/en/documentation).

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In the CAx Data area of "mySupport", you can have access the latest product data for your CAx or CAe system.

You configure your own download package with a few clicks.

In doing so you can select:

- Product images, 2D dimension drawings, 3D models, internal circuit diagrams, EPLAN macro files
- Manuals, characteristics, operating manuals, certificates
- Product master data

You can find "mySupport" - CAx Data in the Internet (http://support.industry.siemens.com/my/ww/en/CAxOnline).

Application examples

The application examples support you with various tools and examples for solving your automation tasks. Solutions are shown in interplay with multiple components in the system - separated from the focus in individual products.

You can find the application examples on the Internet (https://support.industry.siemens.com/sc/ww/en/sc/2054).

TIA Selection Tool

With the TIA Selection Tool, you can select, configure and order devices for Totally Integrated Automation (TIA).
This tool is the successor of the SIMATIC Selection Tool and combines the known configurators for automation technology into one tool.
With the TIA Selection Tool, you can generate a complete order list from your product selection or product configuration.

You can find the TIA Selection Tool on the Internet (http://w3.siemens.com/mcms/topics/en/simatic/tia-selection-tool).

SIMATIC Automation Tool

You can use the SIMATIC Automation Tool to run commissioning and maintenance activities simultaneously on various SIMATIC S7 stations as a bulk operation independently of the TIA Portal.

The SIMATIC Automation Tool provides a multitude of functions:

- Scanning of a PROFINET/Ethernet network and identification of all connected CPUs
- Address assignment (IP, subnet, gateway) and station name (PROFINET device) to a CPU
- Transfer of the data and the programming device/PC time converted to UTC time to the module
- Program download to CPU
- Operating mode switchover RUN/STOP
- Localization of the CPU by means of LED flashing
- Reading out CPU error information
- Reading the CPU diagnostic buffer
- Reset to factory settings
- Updating the firmware of the CPU and connected modules

You can find the SIMATIC Automation Tool on the Internet (https://support.industry.siemens.com/cs/ww/en/view/98161300).

PRONETA

With SIEMENS PRONETA (PROFINET network analysis), you analyze the plant network during commissioning. PRONETA features two core functions:

- The topology overview independently scans PROFINET and all connected components.
- The IO check is a fast test of the wiring and the module configuration of a system.

You can find SIEMENS PRONETA on the Internet (https://support.industry.siemens.com/cs/ww/en/view/67460624).

SINETPLAN

SINETPLAN, the Siemens Network Planner, supports you in planning automation systems and networks based on PROFINET. The tool facilitates professional and predictive dimensioning of your PROFINET installation as early as in the planning stage. In addition, SINETPLAN supports you during network optimization and helps you to exploit network resources optimally and to plan reserves. This helps to prevent problems in commissioning or failures during productive operation even in advance of a planned operation. This increases the availability of the production plant and helps improve operational safety.

The advantages at a glance

- Network optimization thanks to port-specific calculation of the network load
- Increased production availability thanks to online scan and verification of existing systems
- Transparency before commissioning through importing and simulation of existing STEP 7 projects
- Efficiency through securing existing investments in the long term and optimal exploitation of resources

You can find SINETPLAN on the Internet (https://www.siemens.com/sinetplan).

Product overview

2

2.1 Properties

Article number

6ES7155-6BA01-0CN0

Article number 6ES7155-6BA01-0CN0 contains the following components:

- Interface module IM 155-6 DP HF (6ES7155-6BU01-0CN0)
- Server module (6ES7193-6PA00-0AA0)
- PROFIBUS FastConnect bus connector (6ES7972-0BB70-0XA0)

View of the module

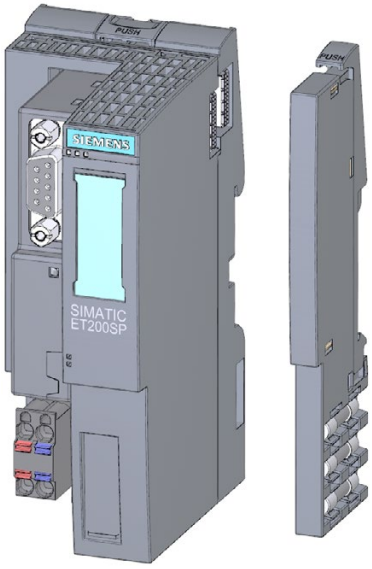


Figure 2-1 View of the 155-6 DP HF interface module with supplied accessories

Properties

The module has the following technical properties:

- Connects the ET 200SP distributed I/O system with PROFIBUS DP
- Power supply 1 L+ 24 V DC (SELV/PELV)
- Bus connection via RS485 interface

The module supports the following functions (Page 14):

Maximum configuration

- 244 bytes I/O data
- 32 I/O modules and 16 ET 200AL modules

Accessories

You order the following accessories separately:

- Labeling strips
- Reference identification label

You can find additional information on the accessories in the ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293) system manual.

Server module

The server module is included in the product package of the interface module and available separately as an accessory.

The server module has the following properties:

- Terminates the backplane bus of the ET 200SP distributed I/O system
- Features a support for 3 spare fuses (5 × 20 mm)
- Provides station functions, e.g., status bytes
- Identification data I&M 0 to 3

Note

You need to configure the server module in the configuration software.

To do so, place the server module with the required length of status bytes at the last slot of the configuration. When there are 32 I/O modules, the server module is inserted at slot 33.

PROFIBUS FastConnect bus connector

The PROFIBUS FastConnect bus connector is included in the product package of the interface module and also available separately as an accessory.

You can find additional information on the PROFIBUS FastConnect bus connector in the corresponding product information on the Internet (http://support.automation.siemens.com/WW/view/en/58648998).

Configuration with more than 244 bytes of parameter data

With a configuration as of STEP 7 V5.5 SP 3 with HSP 242, you have the option of operating the IM 155-6 DP HF interface module as of 6ES7155-6BA00-0CN0 in DPV1 mode with more than 244 bytes of parameter data. Configuration with the GSD file does not offer this option.

Reference

You can find additional information on identification data in the ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293) system manual.

2.2 Functions

2.2.1 Functions

Introduction

The interface module supports the following functions:

- Identification data I&M 0 to 3
- PROFIBUS DP
- Firmware update via PROFIBUS DP
- Configuration control by means of the user program
- Operation as DPV1 slave
- Operation after Y-link (not with F-modules)
- Station extension via ET-Connection
- F-direct data exchange

Requirements

The table below shows the software requirements for a configuration with the IM 155-6 DP HF interface module:

Table 2- 1 Version dependencies of other module functions

Function	Product version of the module as of	Firmware version of the module as of	Configuration software		
			Configuration with GSD file (http://support.automation.siemens.com/WW/view/en/19698639/130000) / software from a third-party manufacturer[1]	STEP 7 as of V5.5 SP3 with HSP0242	STEP 7 (TIA Portal) as of V13
Operation after Y-link (not with F-modules)	1	V1.1.0	X	-	-
Hot-swapping	1	V1.0.0	X	X	X
Station extension via ET-Connection	1	V3.0.0	X	X (as of HSP0242 V2)	-
F-direct data exchange	1	V3.1.0	-	X (as of HSP0242 V3)	-
Interface module; article number: 6ES7155-6BA01-0CN0	1	V4.2	-	X [2]	X (as of V15.1)

[1] Systems of third-party manufacturers: Depending on the range of functions of the third-party system

[2] Configure the module as version 6ES7155-6BA00-0CN0 FW V3.1 (as of HSP0242 V3)

2.2.2 Configuration control

Properties

Configuration control allows you to prepare your distributed I/O system for future extensions or options. Configuration control means that you can configure the planned maximum configuration of your distributed I/O system in advance and vary it later in a flexible manner by means of the user program.

Reference

You can find more information on configuration control

- in the ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293) system manual
- on the Internet under the following link: Application collection (http://support.automation.siemens.com/WW/view/en/29430270)
- in the STEP 7 online help.

Connecting

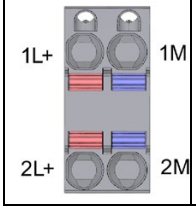
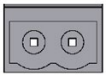
3

3.1 Terminal assignment

24 V DC supply voltage

The table below shows the signal names and descriptions of the pin assignment of the 24 V DC supply voltage.

Table 3- 1 Pin assignment 24 V DC supply voltage

View		Signal name[1)]	Description
Connector	IM connection		
		1L+	24 V DC
		2L+	24 V DC (for looping through)[2]
		1M	Ground
		2M	Ground (for looping through)[2]

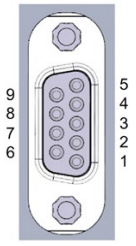
1 1L+ and 2L+ as well as 1M and 2M are internally bridged.

2 Maximum 10 A permitted.

PROFIBUS DP with RS485 interface

The following table shows the signal names and descriptions of the terminal assignment of the PROFIBUS DP interface.

Table 3- 2 Terminal assignment PROFIBUS DP with RS485 interface

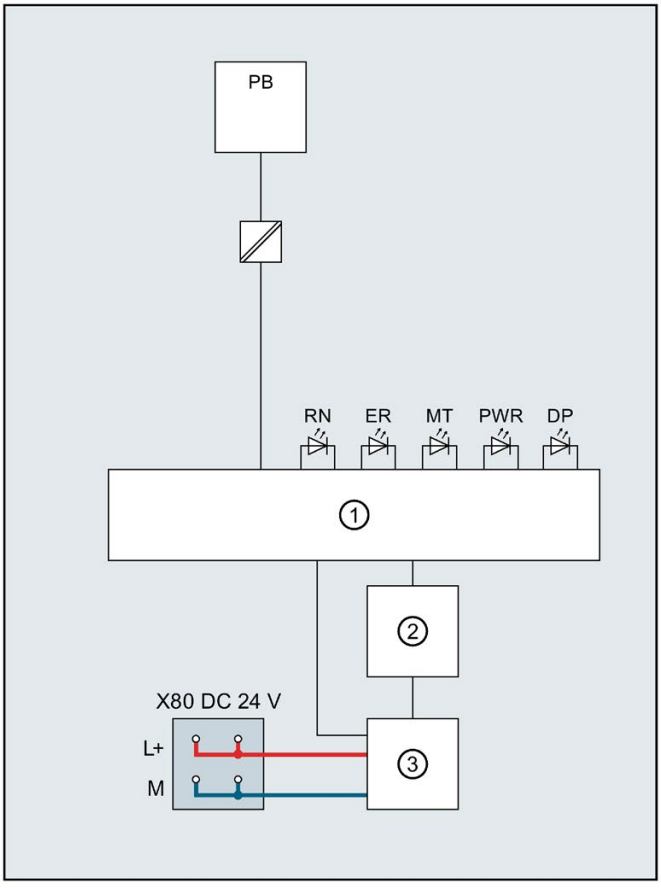
View		Signal name	Description
	1	-	-
	2	-	-
	3	RxD/TxD-P	Data line B
	4	RTS	Request To Send
	5	M5V2	DP data reference potential (from station)
	6	P5V2	Supply plus (from station)
	7	-	-
	8	RxD/TxD-N	Data line A
	9	-	-

Reference

You can find additional information on connecting the interface module and on the accessories in the ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293) system manual.

3.2 Block diagram

The following figure show the block diagram of the IM 155-6 DP HF interface module.



①	ET 200SP backplane bus interface and electronics	L+	24 V DC supply voltage
②	Backplane bus	M	Ground
③	Internal power supply	RN	RUN/STOP LED (green)
X80 24 V DC	Feed supply voltage	ER	ERROR LED (red)
PB	PROFIBUS interface	MT	MAINT LED (yellow)
		PWR	POWER LED (green)
		DP	PROFIBUS DP LED (green)

Figure 3-1 Block diagram of the IM 155-6 DP HF interface module

3.3 Setting the PROFIBUS DP address

Introduction

On the interface module (PROFIBUS), set the PROFIBUS DP address for PROFIBUS DP using the DIP switch. By setting the PROFIBUS DP address, you specify where the ET 200SP is to be addressed on the PROFIBUS DP.

Requirements

- Each PROFIBUS DP address may be assigned only once on the PROFIBUS DP.
- Valid PROFIBUS DP addresses are 1 to 125.
- The set PROFIBUS DP address must match the PROFIBUS DP address specified for the ET 200SP in the configuration software.

Required tools

Screwdriver 3 - 3.5 mm

Setting the PROFIBUS DP address

1. Slide the window of the interface module upwards.
2. Use a screwdriver to set the required PROFIBUS address via the DIP switch.
3. Close the window.

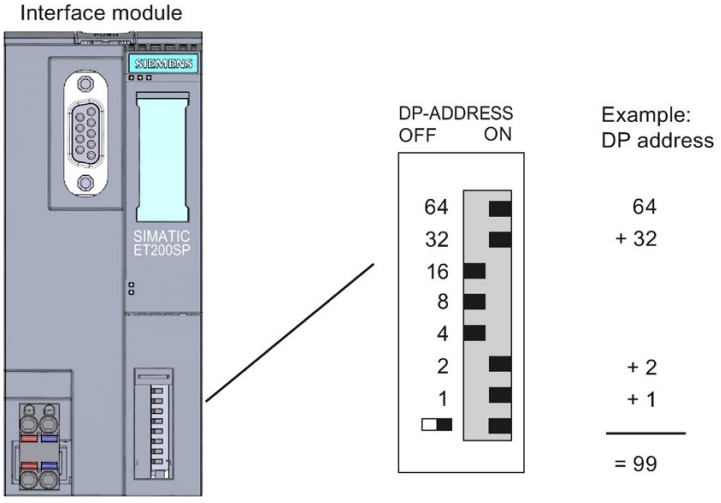


Figure 3-2 Setting the PROFIBUS DP address

Changing the PROFIBUS DP address

You can change the PROFIBUS DP address in exactly the same way as you set it. **A change in the PROFIBUS DP address only becomes valid for the ET 200SP** after a POWER ON of the interface module.

Parameters/address space

4

4.1 Parameters

Parameters for IM 155-6 DP HF interface module

The following table shows the parameters for the IM 155-6 DP HF interface module.

Table 4- 1 Parameters for IM 155-6 DP HF interface module (GSD file)

Parameters	Value range	Default[3]	Effective range
Configuration control [1]	Disable/enable	Disable	ET 200SP
Startup when preset/actual configuration differ	Yes/No	No	ET 200SP
Diagnostics interrupt	Yes/No	Yes	ET 200SP
Hardware interrupt	Yes/No	Yes	ET 200SP
Pull/plug module interrupt[2]	Yes/No	No	ET 200SP

1 Note that the "Startup if preset configuration does not match actual configuration" parameter is always activated when you use configuration control.

2 The “Pull/plug” parameter is always activated in the GSD file.

3 The defaults apply to the default startup. If no other parameters are specified by the DP master, the IM 155-6 DP HF starts up with these parameters.

Note

Only for configuration using the PROFIBUS GSD file, does not affect configuration with STEP 7 via HSP:

Not all parameters of an I/O module are provided by the GSD file with GSD configuration, because the PROFIBUS standard limits the number of parameters to 244 bytes per ET 200SP. These parameters can be configured later using data record 128, if necessary. The description is available in the respective manual of the employed I/O module.

Note

PROFIBUS GSD configuration as of STEP 7 V5.5 SP3

The universal module must not be configured.

4.2 Description of parameters

4.2.1 Configuration control

You can use this parameter to enable the configuration control function in the ET 200SP distributed I/O system.

Note

Configuration control

The "Configuration control" function can only be used if you set the parameter "Startup if preset configuration does not match actual configuration" to yes at the same time.

Note

Configuring the enable

If you configure the enable, the ET 200SP distributed I/O system requires control data record 196 from the user program so that the ET 200SP distributed I/O system can operate the I/O modules.

Reference

You can find additional information in the ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/58649293) system manual and in the STEP 7 online help.

4.2.2 Startup when expected/actual config differ

If the parameter is enabled and

- modules are removed and inserted during operation, this does not lead to a station failure of the ET 200SP distributed I/O system.
- If the preset configuration does not match the actual configuration, the ET 200SP distributed I/O system continues to exchange data with the DP master.

If the parameter is disabled and

- modules are removed and inserted during operation, this leads to a station failure of the ET 200SP distributed I/O system.
- If the preset configuration does not match the actual configuration, data exchange does not take place between the DP master and the ET 200SP distributed I/O system.

4.2.3 Diagnostic interrupt

You can use this parameter to enable or disable diagnostic interrupts.

4.2.4 Hardware interrupt

You can use this parameter to enable or disable hardware interrupts.

4.2.5 Insert/remove module interrupt

You can use this parameter to enable or disable insert/remove module interrupts.

4.3 Substitute value behavior

The substitute value behavior is implemented by the DP master per slot in the ET 200SP distributed I/O system.

The respective output reacts according to its configured substitute value behavior:

- Current-free/voltage-free
- Keep last value
- Output substitute value

The substitute value behavior is triggered in the following cases:

- STOP DP master
- DP master failure (connection interruption)
- Firmware update
- Station stop, for example, due to:
  - No server module
  - At least one I/O module installed on an incorrect BaseUnit
- Deactivate DP slave

Note

Reducing a configuration

If you reduce the configuration of the ET 200SP distributed I/O system and download the new configuration to the CPU, the modules no longer configured but still present retain their original substitute value behavior. This applies until the supply voltage on the BaseUnit BU...D or on the interface module is switched off.

The "current-free/voltage-free" behavior takes effect in the following cases:

- Firmware update
- Configuration control: receipt of a new control data record
- Incorrectly configured module
- Module with incorrect parameter assignment

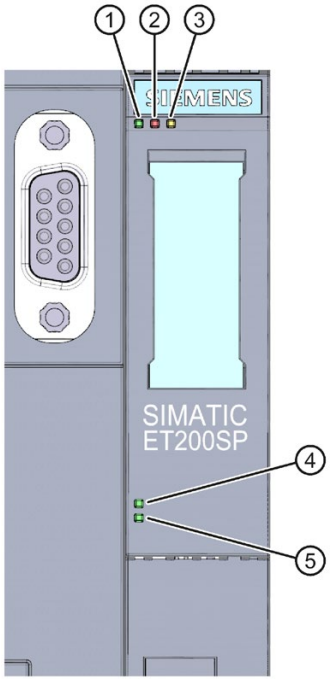
Interrupts, error messages, diagnostics and system alarms

5

5.1 Status and error displays

LED displays

The figure below shows the LED display on the interface module:



① RN (green)
② ER (red)
③ MT (yellow)
④ DP (green)
⑤ PWR (green)

Figure 5-1 LED displays on the interface module

Meaning of the LED displays

The following tables contain the meaning of the status and error displays.

RN/ER/MT LEDs on the interface module

Table 5- 1 Status and error displays of RN/ER/MT LEDs

LEDs			Meaning	Remedy
RN (RUN)	ER (ERROR)	MT (MAINT)		
Off	Off	Off	No or too little supply voltage at interface module	Check the supply voltage or switch it on at the interface module.[1]
On	On	On	Test of LEDs during startup: The three LEDs light up simultaneously for approximately 0.25 s.	-
Flashes	Off	Off	Interface module is deactivated.	Activate the interface module with the configuration software or the user program.
			Interface module is not configured.	Configure the interface module with the configuration software.
			ET 200SP starts up.	-
			ET 200SP is being assigned parameters.	
On	Not relevant	Not relevant	ET 200SP is currently exchanging data with the DP master.	-
Not relevant	Flashes	Not relevant	Group error and group error channels	Evaluate the diagnostics and eliminate the error.
			The preset configuration does not match the actual configuration of the ET 200SP.	Check the configuration of the ET 200SP to see whether a module is missing or faulty, or whether a non-configured module is inserted.
			Invalid configuration states	See the Invalid configuration states of the ET 200SP on PROFINET DP (Page 47) section.
			Parameter assignment error in the I/O module	Evaluate the display of the module status in STEP 7 and correct the error in the corresponding I/O module.
Not relevant	Not relevant	On	Maintenance is demanded.	Perform maintenance
Flashes	Flashes	Flashes	Hardware or firmware faulty.[2]	Run a firmware update. If the error persists, contact Siemens Industry Online Support. Replace the interface module.

1 PWR LED On (on interface module): Check the backplane bus for a short-circuit.

2 DP LED Off

PWR LED on the interface module

Table 5- 2 Status display of the PWR LED

PWR LED	Meaning	Remedy
□ Off	No or too little supply voltage	Check the supply voltage.
■ On	Supply voltage present	-

LED DP on the RS485 interface

Table 5- 3 Status display of the DP LED

LED DP	Meaning	Remedy
□ Off	There is no connection between the PROFIBUS interface of your PROFIBUS device and a communication partner (for example, DP master).	Check whether the bus cable to the DP master is broken.
■ On	There is a connection between the PROFIBUS interface of your PROFIBUS device and a communication partner (for example, DP master).	-

LED display of configuration errors

Configuration errors of the ET 200SP distributed I/O system are output on the interface module by the ERROR (red) and MAINT (yellow) LEDs.

The following configuration errors are signaled by the LEDs:

- No server module
- Interruptions or short-circuit on the backplane bus

Operating principle

The LED error display provides information on the cause of the error. After a notification by means of a flashing signal, the error type and then the error location/error code are displayed in each case.

The LED error display:

- Is activated during POWER ON and during operation
- Has priority over all other states that are displayed by means of the ERROR- and MAINT-LED
- Remains on until the cause of the error has been eliminated

Table 5- 4 Display of error type and error location

Sequence		Description
1	ERROR- and MAINT-LED flash 3x with 0.5 Hz	Indication of the error type
2	MAINT-LED flashes with 1 Hz	Display of error type (decimal)
3	ERROR- and MAINT-LED flash 3x with 2 Hz	Indication of error location/error code
4	ERROR-LED flashes with 1 Hz	Display of the tens position (decimal) of the error location/error code
5	MAINT-LED flashes with 1 Hz	Display of the units position (decimal) of the error location/error code
6	Repetition of 1 to 5 until the cause of the error has been eliminated.	

Error display

The following table shows the possible causes of error that can occur.

Table 5- 5 Error display

Error type (MAINT)	Error location (ERROR/MAINT)	Cause of error	Solution
1	33*	• No server module • Interruptions on the backplane bus • Short-circuit on the backplane bus	Check the configuration of the ET 200SP.

* Slot

Note

The following LEDs indicate a short-circuit in the backplane bus supply or in the bus connection supply:

- PWR-LED: On
- RN-, ER- and MT-LED: Off

5.2 Interrupts

5.2.1 Introduction

Definition

The interrupt section of the slave diagnostics indicates the interrupt type and the event that led to an interrupt being triggered. The interrupt section comprises 62 bytes including an interrupt header.

Position in the diagnostics frame

The interrupt section is located after the channel diagnostics.

Data record

The diagnostic data of a module are located in the data records 0 and 1:

- Data record 0 contains 4 bytes of diagnostics data that describe the current status of the distributed I/O system. DS0 is part of the header information of OB 82 (local data bytes 8 to 11).
- Data record 1 contains 4 bytes of diagnostics data that are also available in data record 0.

The figure below shows the structure of data record 1:

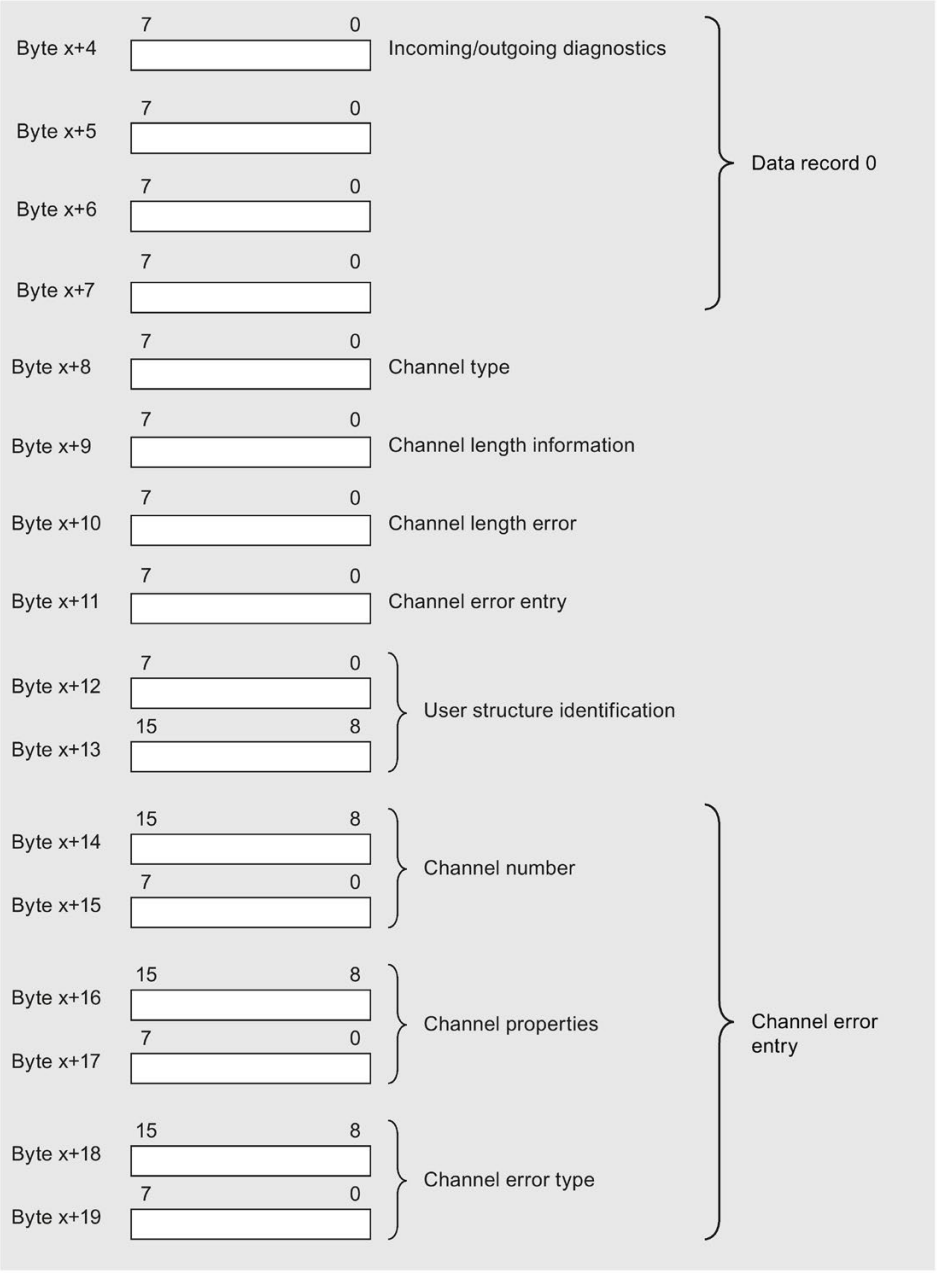


Figure 5-2 Structure of data record 1

Reading data records

DS0 and DS1 can be read with SFC 59 (RD_REC) or SFB 52 (RDREC). The data length of DS 1 can be up to 240 bytes. In this case, DS1 includes up to 38 channel error entries.

Note the figures below in this section.

Content

The contents of the interrupt information depend on the interrupt type:

- In the case of diagnostic interrupts, diagnostic data record 1 (up to 58 bytes) is sent as interrupt status information (starting from byte x+4).
- The length of the interrupt status information for hardware interrupts is 4 bytes.

Structure of interrupts

The figure below shows the structure of the interrupt section for the ET 200SP distributed I/O system:

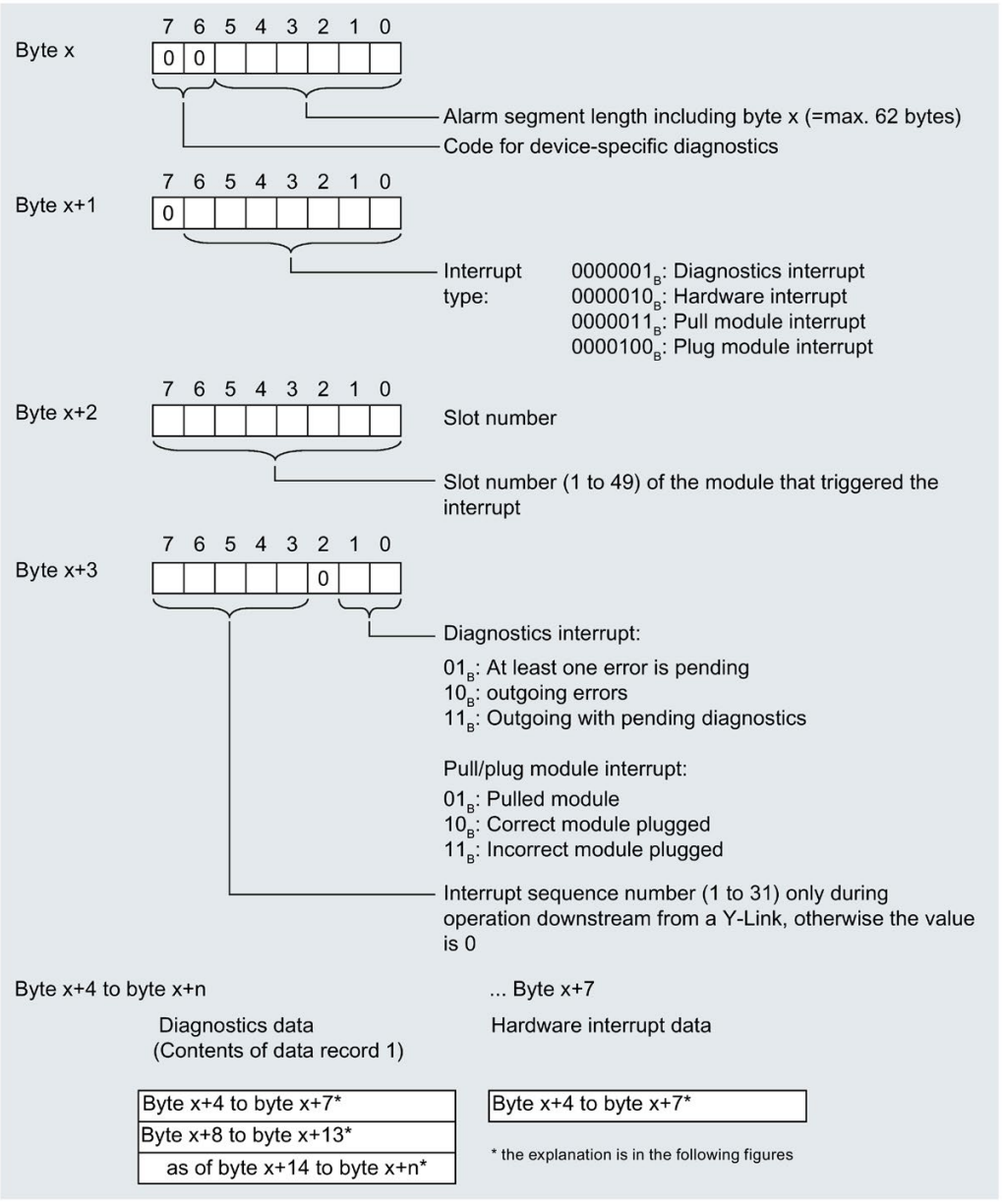


Figure 5-3 Structure of the interrupt status of the interrupt section

Diagnostic interrupt, byte x+4 to x+7

The figure below shows the structure starting at byte x+4 to x+7 for diagnostic interrupt:

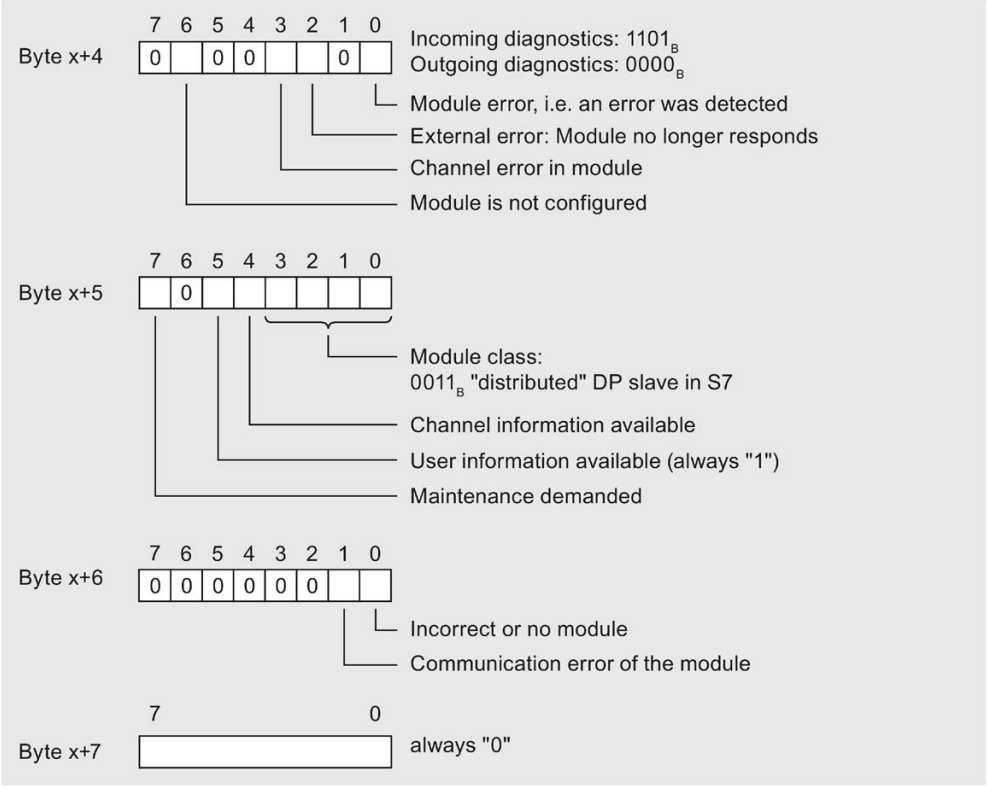


Figure 5-4 Structure of bytes x+4 to x+7 for diagnostic interrupt

Diagnostic interrupt from the modules, starting at byte x+8

The figure below shows the structure starting at byte x+8:

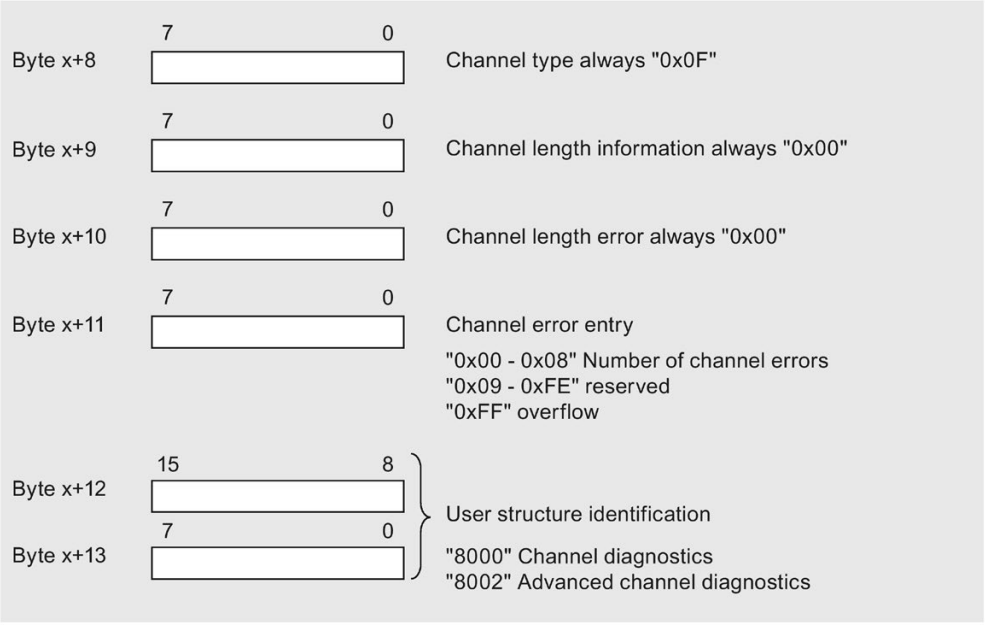


Figure 5-5 Structure starting at byte x+8

Diagnostic interrupt from the modules, starting at byte x+14

The channel error entries start from byte x+14. A channel error entry is 6 bytes long and can follow 8 times starting from byte x+14.

If you read the channel error entries using an SFB or SFC, 38 channel diagnostics are possible.

The figure below shows the structure starting at byte x+14:

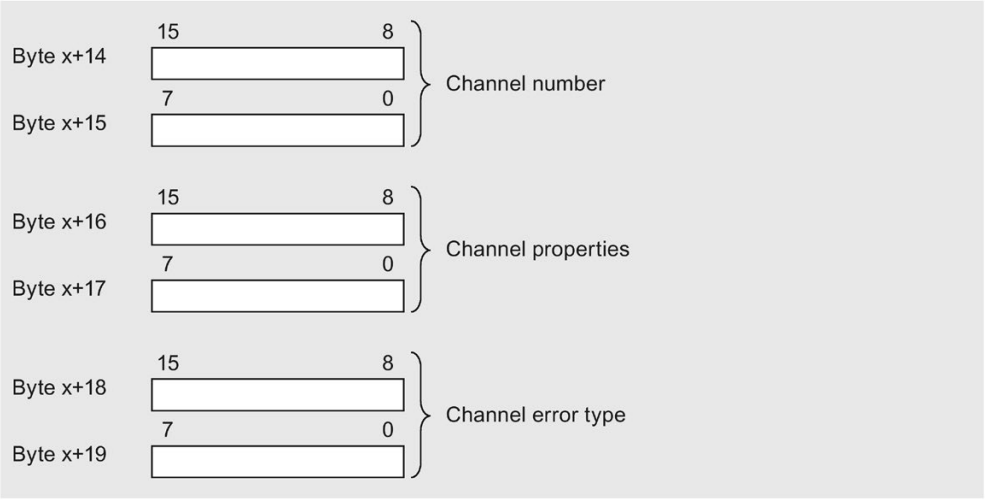


Figure 5-6 Structure starting from byte x+14

The following table is used to explain the channel error entries:

	Description	
Channel number	0 to 63: Channel number for channel error 0x8000: Entire submodule	
Channel properties	Bit 0 to 7	00_H: Free data type 01_H: bit 02_H: 2 bit 03_H: 4 bit 04_H: byte 05_H: word 06_H: Double word 07_H bis FF_H: Reserve
	Bit 8	0: Channel 1: Channel group
	Bit 9, 10	00_H: Diagnostics 01_H: Maintenance demanded 02_H: Maintenance required 03_H: Reserve
	Bit 11, 12	00_H: Channel error-free 01_H: Incoming diagnostics 02_H: Outgoing diagnostics 03_H: Outgoing diagnostics, but other diagnostics are also pending on this channel
	Bit 13 to 15	00_H: Reserve 01_H: Input channel 02_H: Output channel 03_H: Input/output channel
Channel error type	Refer to respective manual for explanation.	

Example of a diagnostic interrupt

The figure below shows an example of a diagnostic interrupt (part 1):

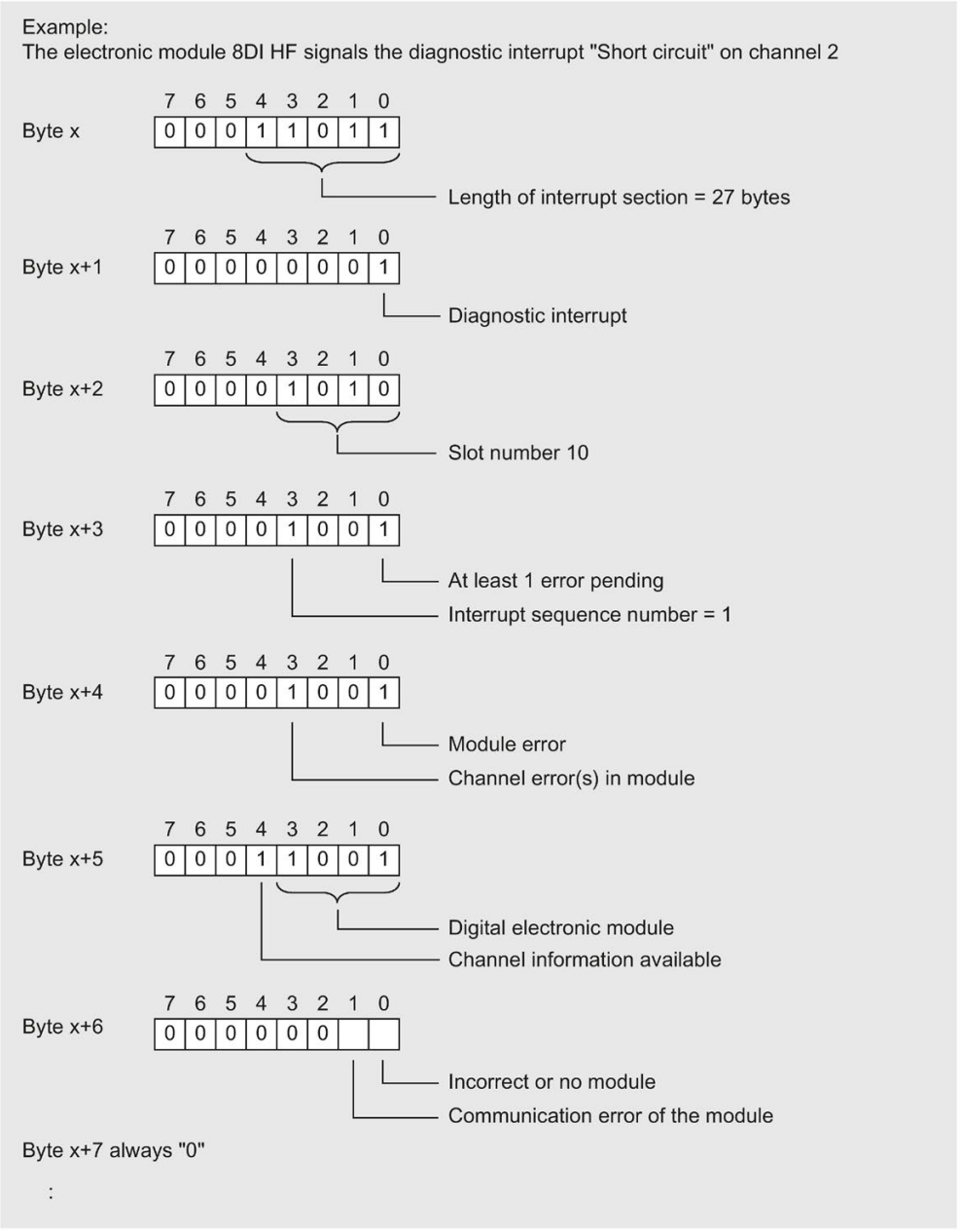


Figure 5-7 Example of a diagnostic interrupt (part 1)

The figure below shows an example of a diagnostic interrupt (part 2):

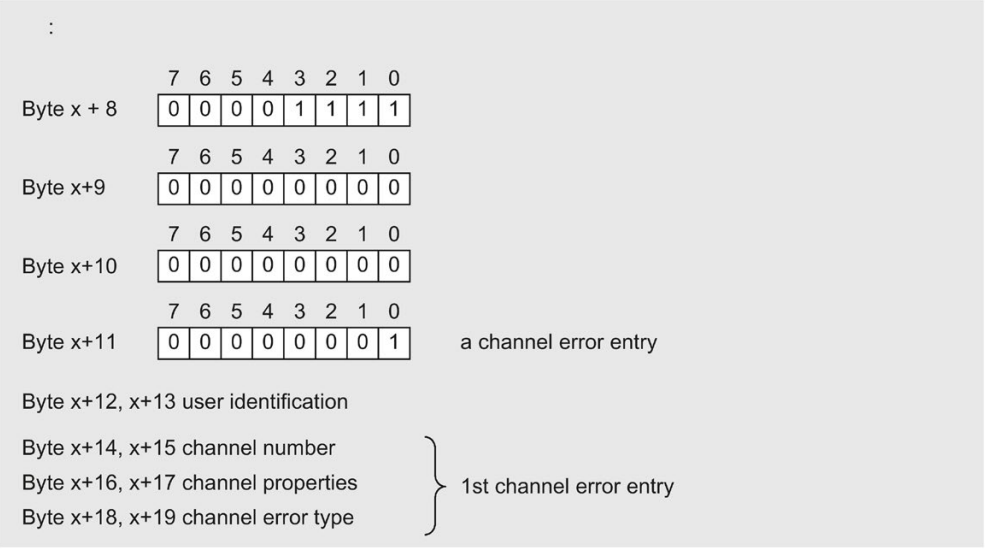


Figure 5-8 Example of a diagnostic interrupt (part 2)

Hardware interrupt of digital and analog input modules

The figure below shows the structure starting at byte x+4 for the hardware interrupt:

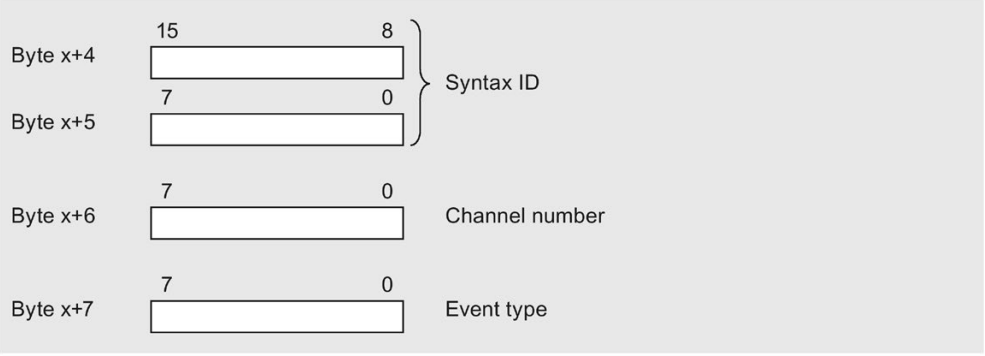


Figure 5-9 Structure starting at byte x+4 for hardware interrupt

5.2.2 Evaluating interrupts of ET 200SP

Introduction

With certain process statuses/errors, the DP slave in each case creates an interrupt block with the corresponding information in the diagnostics frame (DPV1 interrupt mechanism). Regardless of this, the diagnostic status of the DP slave is displayed in the identifier-related diagnostics, in the module status, and in the channel diagnostics.

Interrupts in DPV1 mode

The ET 200SP distributed I/O system supports the following interrupts:

- Diagnostic interrupts
- Hardware interrupts
- Insert/remove module interrupts

5.2.3 Triggering of a diagnostics interrupt

When an event comes or goes (e.g. wire break on a channel of an I/O module), the module triggers a diagnostics interrupt if "Enable: diagnostic interrupt" is set.

The CPU interrupts user program execution and processes the diagnostic interrupt OB (OB 82). The event that triggered the interrupt is entered in the start information of the diagnostic interrupt OB.

5.2.4 Triggering a hardware interrupt

When a hardware interrupt occurs, the CPU interrupts execution of the user program and processes the hardware interrupt OB, for example OB 40. The event that triggered the interrupt is entered in the start information of the hardware interrupt OB.

Note

Diagnostics "Hardware interrupt lost" (from I/O module)

Do not use hardware interrupts for technological purposes (e.g., cyclical generation of hardware interrupts).

If the hardware interrupt load is too high, hardware interrupts can get lost depending on the number of I/O modules and the communication load.

5.2.5 Triggering an insert/remove module interrupt

When an insert/remove module interrupt occurs, the CPU interrupts execution of the user program and processes the insert/remove module interrupt OB (OB 83). The event that triggered the interrupt is entered in the start information of the insert/remove module interrupt OB.

5.3 Alarms

Actions after a diagnostics alarm in DPV1 mode

The error is entered in the channel diagnostics in the diagnostics frame:

- In DPV1 mode, diagnostics can be reported as diagnostic interrupts.
- After a diagnostics alarm, this is
  - entered in the diagnostics frame as diagnostic interrupt block (always for one interrupt only).
  - Stored in the diagnostics buffer of the CPU.
- The ERROR LED of the interface module flashes.
- OB 82 is called. If OB 82 does not exist, the CPU changes to STOP mode.
- Acknowledgment of diagnostic interrupt (a new interrupt is then possible)

Length of the diagnostics frame

- The maximum frame length for the ET 200SP distributed I/O system with IM155-6 DP HF interface module (DPV1 mode) is 244 bytes.
- The minimum frame length is 6 bytes.

Reading out the diagnostics data

Table 5- 6 Reading out the diagnostics data with STEP 7

Automation system with DP master	Application	See...
SIMATIC S7/M7	Slave diagnostics data as plain text in the "DP slave diagnostics" tab in the STEP 7 user interface	"Diagnosing hardware" in the STEP 7 online help
	Instruction "DP NRM_DG" (SFC 13) Reading out slave diagnostics (store in the data area of the user program)	SFC, see STEP 7 online help
	Instruction "RD_REC" (SFC 59) Reading out data records of the S7 diagnostics data (store in the data area of the user program)	See System and Standard Functions reference manual
	Instruction "RDREC" (SFB 52) Reading data records from the DP slave	SFB, see STEP 7 online help (system functions/function blocks)
	Instruction "RALRM" (SFB 54) Receiving interrupts from the interrupt OBs	SFB, see STEP 7 online help (system functions/function blocks)

5.3.1 Slave diagnostics

The figure below shows the structure of the slave diagnostics.

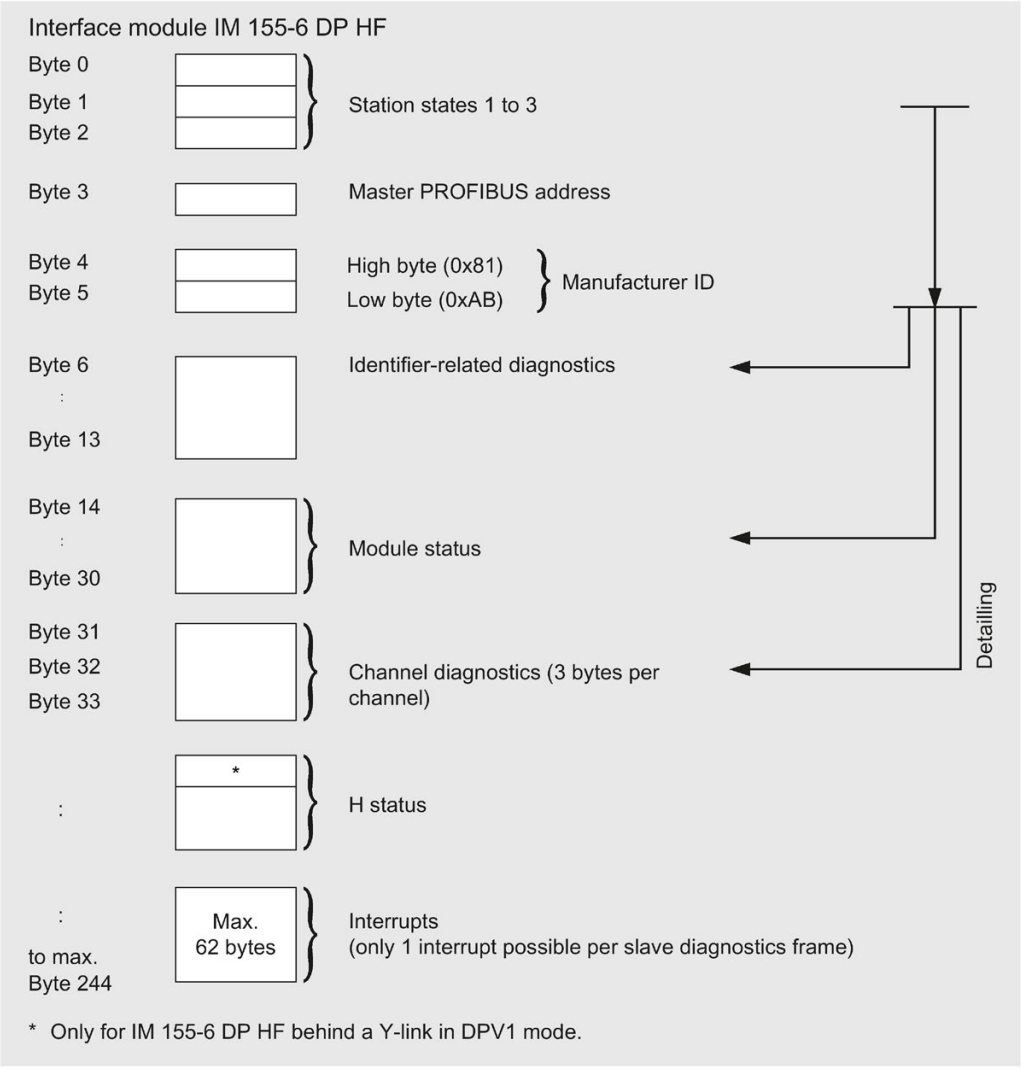


Figure 5-10 Structure of the slave diagnostics

Note

The length of the diagnostics frame varies with the IM 155-6 DP HF (depending on parameter assignment) between 6 and 244 bytes in DPV1 mode.

You can identify the length of the last received diagnostics frame in STEP 7 from the RET_VAL parameter of the SFC 13.

5.3.2 Station statuses 1 to 3

Station statuses 1 to 3 provide an overview of the status of a DP slave.

Structure of station status 1 (byte 0)

Table 5- 7 Structure of station status 1 (byte 0)

Bit	Meaning	Cause/Remedy
0	1: The DP slave is not responding to the DP master.	• Is the correct PROFIBUS address set on the DP slave? • Is the bus connector plugged in? • Is the DP slave connected to the voltage supply? • Is the RS485 repeater properly configured?
1	1: The DP slave is not yet ready to exchange data.	• Wait; the DP slave is currently starting up.
2	1: The configuration data transferred from the DP master to the DP slave does not match the DP slave configuration.	• Has the correct station type or the correct DP slave configuration been entered in the configuration software?
3	1: External diagnostics is available. (Group diagnostics display)	• Evaluate the ID-specific diagnostics, the module status, and/or the channel diagnostics. As soon as all errors have been eliminated, bit 3 is reset. The bit is set again when there is a new diagnostics alarm in the bytes of the aforementioned diagnostics.
4	1: The required function is not supported by the DP slave (for example, changing the PROFIBUS address by means of software).	• Check the configuration.
5	1: The DP master cannot interpret the response of the DP slave.	• Check the bus configuration.
6	1: The DP slave type does not match the software configuration.	• Has the correct station type been entered in the configuration software?
7	1: Parameters have been assigned to the DP slave by a different DP master (not the one that currently has access to the DP slave).	• The bit is always 1, for example, if you access the DP slave with the programming device or another DP master. • The PROFIBUS address of the DP master that assigned parameters to the DP slave is located in the "Master PROFIBUS address" diagnostics byte.

Structure of station status 2 (byte 1)

Table 5- 8 Structure of station status 2 (byte 1)

Bit	Meaning	
0	1:	The DP slave parameters need to be reassigned.
1	1:	A diagnostics alarm is present. The DP slave will not operate until the problem is eliminated (static diagnostics alarm).
2	1:	The bit on the DP slave is always "1".
3	1:	The watchdog is activated for this DP slave.
4	1:	The DP slave has received the "FREEZE" control command.[1]
5	1:	The DP slave has received the "SYNC" control command.[1]
6	0:	Bit is always "0".
7	1:	The DP slave is disabled, that is, it has been removed from the processing in progress.
[1] The bit is updated only if another diagnostics alarm also changes.		

Structure of station status 3 (byte 2)

Table 5- 9 Structure of station status 3 (byte 2)

Bit	Meaning	
0 to 6	0:	Bits are always set to "0".
7	1:	• There are more diagnostic alarms pending than the DP slave is able to store. • The DP master cannot enter all the diagnostics alarms sent by the DP slave in its (channel) diagnostics buffer.

5.3.3 Master PROFIBUS address

The master PROFIBUS address diagnostics byte contains the PROFIBUS address of the DP master:

- That assigned parameters to the DP slave
- That has read and write access to the DP slave

The master PROFIBUS address is located in byte 3 of the slave diagnostics.

5.3.4 Identifier-related diagnostics

The identifier-related diagnostics indicates whether modules of the ET 200SP distributed I/O system have errors or not. Identifier-related diagnostics start at byte 6 and comprise 8 bytes.

The figure below shows how the identifier-related diagnostics for the ET 200SP distributed I/O system is structured with the IM 155-6 DP HF interface module:

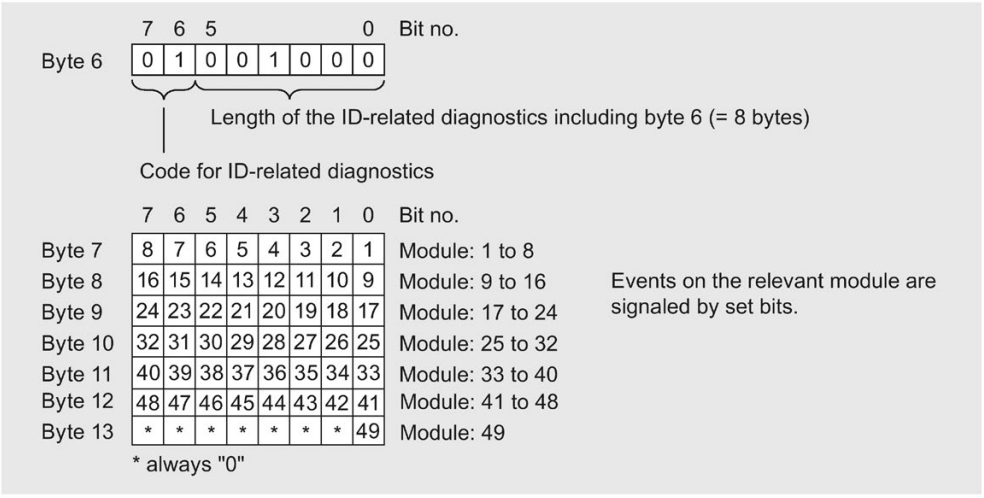


Figure 5-11 Structure of the identifier-related diagnostics

5.3.5 Module status

The module status indicates the status of the configured modules and provides more information on the identifier-related diagnostics with respect to the configuration. The module status begins after the identifier-related diagnostics and comprises 17 bytes.

The following figure shows how the module status for the ET 200SP distributed I/O system is structured with the IM 155-6 DP HF interface module:

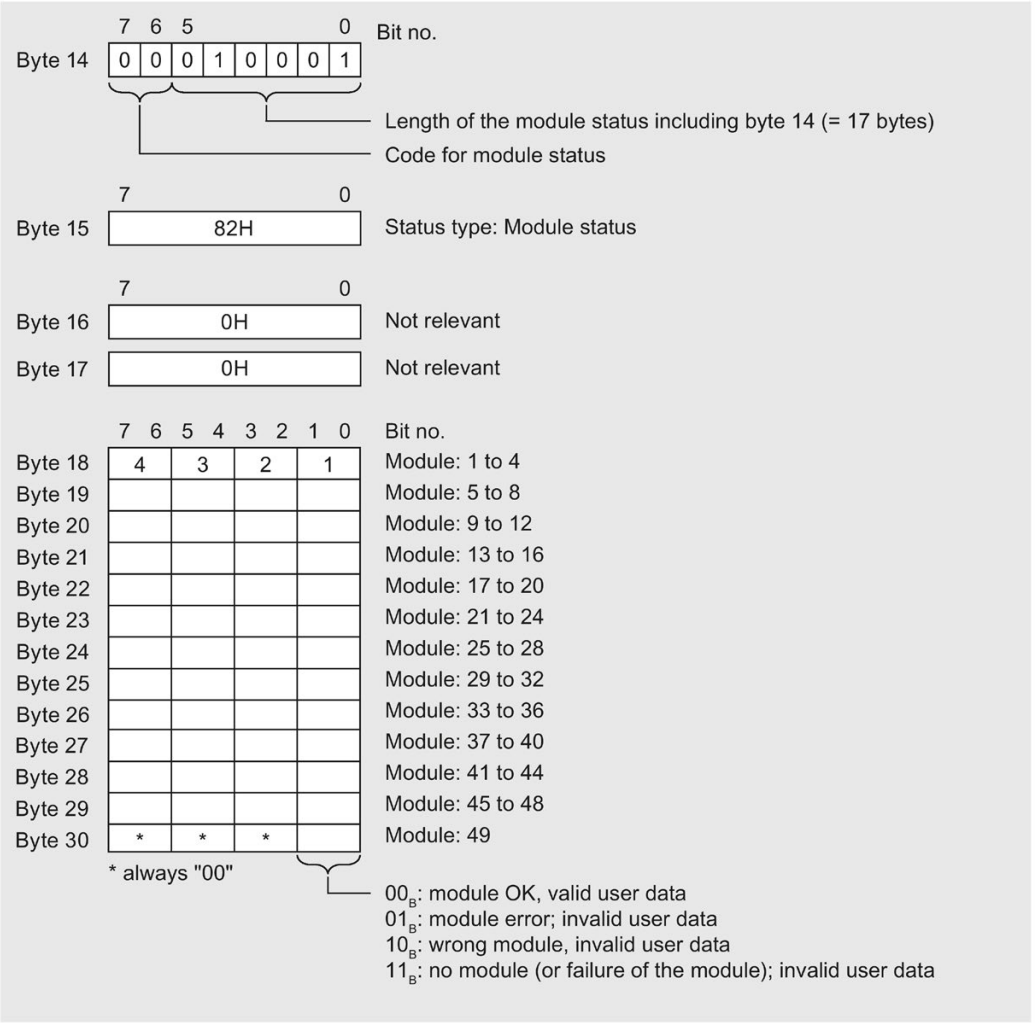


Figure 5-12 Module status structure

5.3.6 Channel diagnostics

Channel diagnostics provides information about channel errors in modules and details of the identifier-related diagnostics. Channel diagnostics begins after the module status. Channel diagnostics does not affect the module status.

The following figure shows how the channel diagnostics for the ET 200SP distributed I/O system is structured with the IM 155-6 DP HF interface module:

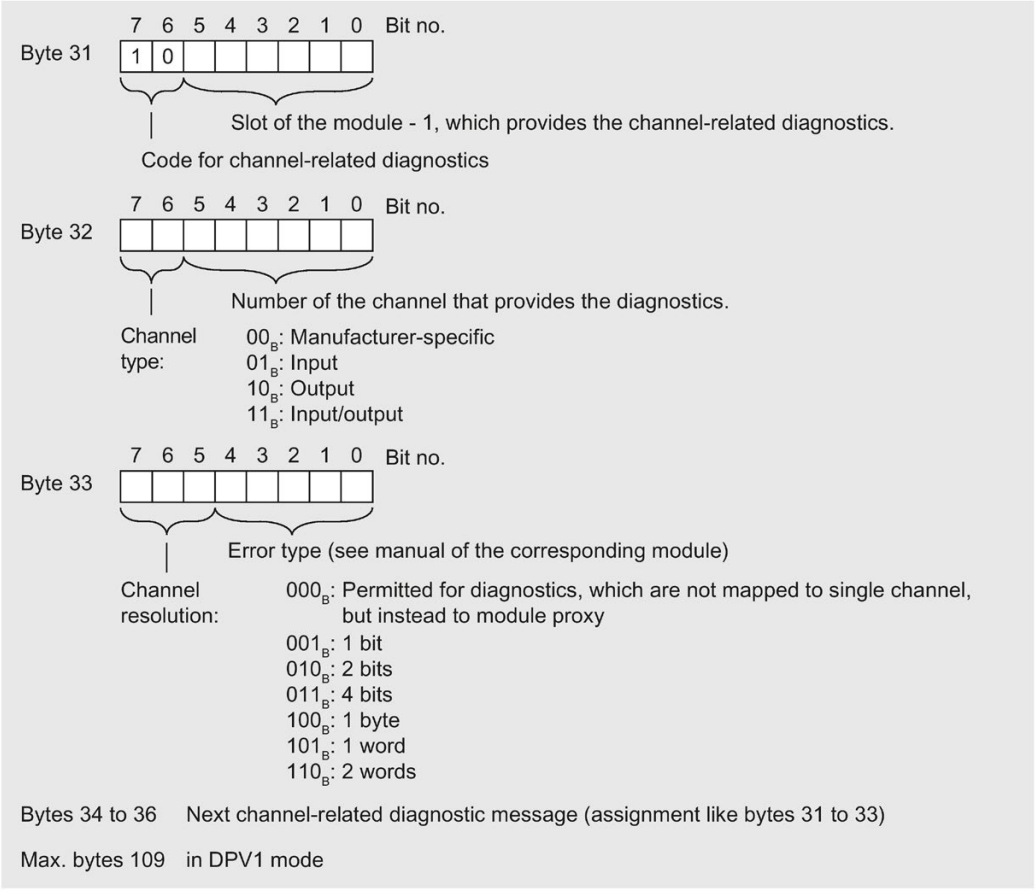


Figure 5-13 Structure of channel diagnostics

When a BaseUnit is incorrectly configured, mapping is made to channel diagnostics. The slot is then apparent from the first byte. In this case, the error type is coded with 0x10 - parameter error. All other fields are set to "0".

5.3.7 H status

Requirements

The H status in the diagnostics frame supplies the IM 155-6 DP HF interface module only when operated behind a Y link (e.g. IM 157) in DPV1 mode. This block can be passed over during the evaluation of the diagnostics frame. The configuration is described in the following section.

Structure of the H status

The following figure shows the structure of the H status of the IM 155-6 DP HF interface module.

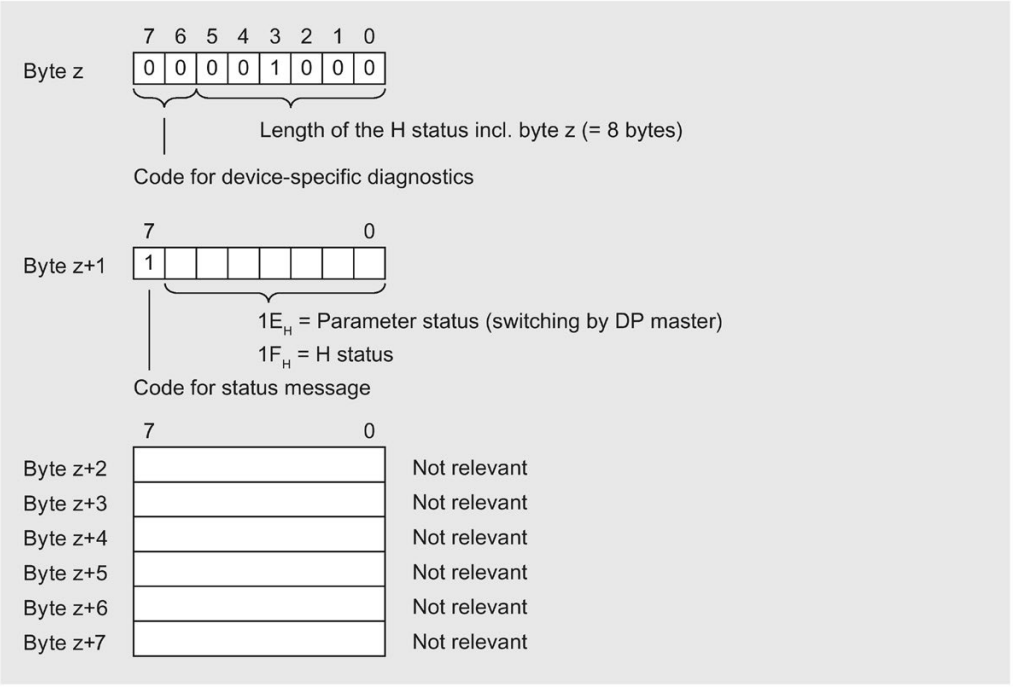


Figure 5-14 Structure of the H status

5.3.8 Invalid configuration states of the ET 200SP on PROFIBUS DP

Incorrect configuration states

The following incorrect configuration states of the ET 200SP distributed I/O system lead to a failure of the DP slave or prevent the start of data exchange.

- Number of modules exceeds maximum configuration.
- Faulty backplane bus (e.g., defective BaseUnit). No interrupt is generated when the ET 200SP backplane bus is interrupted
- No server module
- Configuration exceeds maximum length of 1 m
- Configuration of an incorrect BaseUnit

Note

All I/O modules of the ET 200SP distributed I/O system fail (substitute value behavior) at a station stop. However, the interface module will continue to exchange data.

Revoking the station stop (by correcting the invalid configuration state) leads to a brief failure of the ET 200SP distributed I/O system and automatic restart.

Diagnostics

The table below shows the incorrect configurations and their diagnostics:

Table 5- 10 Diagnostics

Identifier-related diagnostics	Module status	Cause	Response
Slot 33 set, remaining slots not relevant	Slot 33 with 11_B: ""No module; invalid user data" set	• No server module • More than 32 I/O modules • Defective backplane bus	All I/O modules and interface modules fail
All 33 bits set	01_B: "Module error; invalid user data" for all modules	• Configuration > 1 m	All I/O modules and interface modules fail

If the BaseUnit is configured incorrectly, the channel diagnostics "Parameter assignment error" is signaled for the respective slot. Check the parameter "Potential group“ in the parameters of the I/O module.

5.3.9 Load voltage failure on the BaseUnit BU...D

Load voltage failure

If supply voltage fails on the BaseUnit BU...D, the I/O modules react as follows:

- A remove module interrupt is generated if an I/O module is removed during the failure of the supply voltage.
- An insert module interrupt is generated if an I/O module is inserted during the failure of the supply voltage.

Compatibility

6

6.1 Compatibility of modules

Valid firmware versions

The table below lists the valid firmware versions and their field of application for the I/O modules.

I/O modules	Firmware version	Comment
DI 8x24VDC ST	V1.0.1	As of this version, you have the option to operate I/O modules after an IM 155-6 DP HF (6ES7155-6BA00-0CN0) interface module.
DI 16x24VDC ST		
DQ 4x24VDC/2A ST		
DQ 8x24VDC/0.5A ST		
DQ 16x24VDC/0.5A ST		
AI 4xI 2-,4-wire ST		
AI 4xU/I 2-wire ST		
AI 4xRTD/TC 2-,3-,4-wire HF		
AQ 4xU/I ST		

Status of the supply voltage

Load voltage diagnostics are only valid if the station started up with a valid and complete configuration.

- For modules without parameter assignment in the following table, the status of the supply voltage (status byte of the server module) is always signaled as "1" regardless of the actual status of the supply voltage.
- When a potential group is exclusively made up of modules without parameter assignment from the table below, no group diagnostics "Missing supply voltage L+" is signaled for this potential group.

Modules	Article number
DI 8x24VDC ST	6ES7131-6BF00-0BA0
DI 16x24VDC ST	6ES7131-6BH00-0BA0
DI 8x24VDC HF	6ES7131-6BF00-0CA0
DQ 4x24VC/2A ST	6ES7132-6BD20-0BA0
DQ 8x24VDC/0.5A ST	6ES7132-6BF00-0BA0
DQ 16x24VDC/0.5A ST	6ES7132-6BH00-0BA0
DQ 8x24VDC/0.5A HF	6ES7132-6BF00-0CA0

Plugging and pulling (hot-swapping) of ET 200SP I/O modules

NOTICE

Pulling and plugging (hot swapping) of ET 200SP I/O modules during operation on S7-300 via PROFIBUS **DP**

ET 200SP I/O modules can be pulled and plugged:

- As of STEP7 V5.5 SP3 HSP 242 and
- If "Operation if preset configuration <> actual configuration" parameter is enabled.

Note the following when operating the ET 200SP with S7-300 via PROFIBUS DP: Plugging of ET 200SP I/O modules results in a brief station failure of the ET 200SP.

Note

ET 200SP I/O modules can be pulled and plugged without restrictions for all other DP master systems if you enable the "Pull/plug module (OB83)" parameter.

Communication module IO-Link Master CM 4xIO-Link

Note

Communication module IO-Link Master CM 4xIO-Link

Operation of the CM 4xIO-Link IO-Link Master communication module with the IM 155-6 DP HF interface module is supported as of S7-PCT V3.1 and an updated module firmware version/GSD file.

Reaction times for fail-safe modules

The following maximum reaction time of the interface module must be taken into account when calculating the reaction times of fail-safe modules: **Maximum reaction time = 2.3 ms**

First BaseUnit of an ET 200SP in the configuration

The interface modules support plugging a dark-colored BaseUnit in slot 1. This means that modules without a connection to the integrated voltage buses P1 and P2 can now also be configured starting with slot 1. Currently, this applies to the following modules:

- AI EnergyMeter ST (6ES7134-6PA00-0BD0)
- DI 4x120 … 230VAC ST (6ES7131-6FD00-0BB1)
- DQ 4x24 … 230VAC/2A ST (6ES7132-6FD00-0BB1)

Note

First BaseUnit of an ET 200SP in the configuration

Please note the information on limiting the overvoltage and power rating in the AC I/O module manuals.

The 24 V DC supply voltage is fed in via an external fuse.

The 24 V DC supply voltage is provided by a light-colored BaseUnit.

Requirement for configuration of these modules in slot 1:

- Configuration via GSD or GSDML
- Configuration as of STEP7 V5.5 SP4 as of
  - HSP0242 V2.0 for IM155-6 DP HF
- Configuration as of STEP7 V13 SP1

See also: Functions (Page 14)

Technical specifications

7

7.1 Technical specifications

Technical specifications of the IM 155-6 DP HF

The following table shows the technical specifications as of 08/2018. You can find a data sheet including daily updated technical specifications on the Internet (https://support.industry.siemens.com/cs/de/en/pv/6ES7155-6BA01-0CN0/td?dl=de).

Article number	6ES7155-6BA01-0CN0
General information	
Product type designation	IM 155-6DP HF with PROFIBUS connector and server module
Firmware version	V4.2
Product function	
• I&M data	Yes; I&M0 to I&M3
• Module swapping during operation (hot swapping)	Yes; Multi-hot swapping
Engineering with	
• STEP 7 TIA Portal configurable/integrated as of version	V15 SP1
• STEP 7 configurable/integrated as of version	As of V5.5 SP4, only up to FW V3.1
• PROFIBUS as of GSD version/GSD revision	One GSD file each, Revision 3 and 5 and higher
Configuration control	
via dataset	Yes
Supply voltage	
Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes
Mains buffering	
• Mains/voltage failure stored energy time	10 ms
Input current	
Current consumption, max.	335 mA
Inrush current, max.	1.6 A
I^2t	0.038 $A^2 \cdot s$
Power loss	
Power loss, typ.	1.5 W

Article number	6ES7155-6BA01-0CN0
Address area	
Address space per module	
• Address space per module, max.	32 byte; per input / output
Address space per station	
• Address space per station, max.	244 byte; per input / output
Hardware configuration	
Rack	
• Modules per rack, max.	32; + 16 ET 200AL modules
Interfaces	
Number of PROFIBUS interfaces	1
1. Interface	
Interface types	
• RS 485	Yes
• Output current of the interface, max.	90 mA
Protocols	
• PROFIBUS DP slave	Yes
RS 485	
• Transmission rate, max.	12 Mbit/s
PROFIBUS DP	
Services	
– SYNC capability	Yes
– FREEZE capability	Yes
– DPV0	Yes
– DPV1	Yes
Isochronous mode	
Isochronous operation (application synchronized up to terminal)	No
Interrupts/diagnostics/status information	
Status indicator	Yes
Alarms	Yes
Diagnostics function	Yes
Diagnostics indication LED	
• RUN LED	Yes; Green LED
• ERROR LED	Yes; Red LED
• MAINT LED	Yes; yellow LED
• Monitoring of the supply voltage (PWR-LED)	Yes; green PWR LED
• Connection display DP	Yes; Green DP LED
Potential separation	

Article number	6ES7155-6BA01-0CN0
between backplane bus and electronics	No
between PROFIBUS DP and all other circuit components	Yes
between supply and all other circuits	No
Permissible potential difference	
between different circuits	Safety extra low voltage SELV
Isolation	
Isolation tested with	707 V DC (type test)
Ambient conditions	
Ambient temperature during operation	
• horizontal installation, min.	0 °C
• horizontal installation, max.	60 °C
• vertical installation, min.	0 °C
• vertical installation, max.	50 °C
Altitude during operation relating to sea level	
• Installation altitude above sea level, max.	2 000 m; On request: Installation altitudes greater than 2 000 m
Connection method	
ET-Connection	
• via BU/BA Send	Yes; + 16 ET 200AL modules
Dimensions	
Width	50 mm
Height	117 mm
Depth	74 mm
Weights	
Weight, approx.	150 g

Dimension drawing

A

This appendix contains a dimension drawing of the module installed on a mounting rail. Always observe the specified dimensions for installation in cabinets, control rooms, etc.

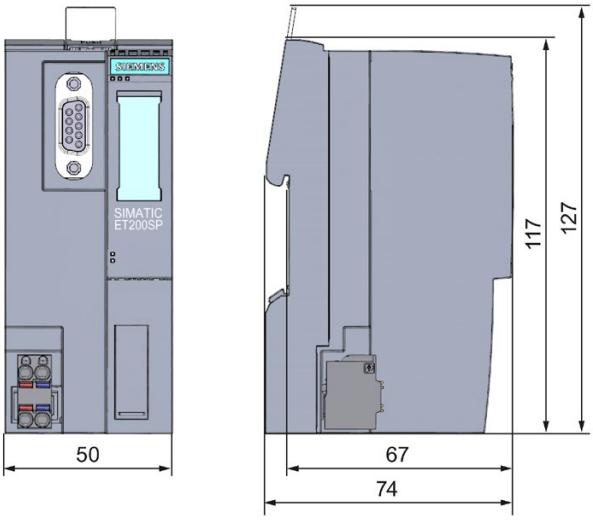


Figure A-1 Dimension drawing of the IM 155-6 DP HF interface module (front and side view)